the earth's motion through the stream. In the former direction (which is 30° or 32° nearer to a meridian than the direction of the sun's apparent place) the exaggeration of the apparent meteor observations is about 2½ times, and in the latter direction only about 1¾ times the original observations of the meteor-paths from perfect parallelism in their cometary orbits. Differences of velocity of the individual meteors from the average velocity of the stream, amounting to a tenth part of their mean speed, would on the other hand produce observations of 5° in the latter, without producing any sensible enlargement of the space included by the radiant region in the former direction. Owing to the powerful action of disturbing forces in changing both the direction and the velocities of motion of the meteors of this stream, a considerable extension of the radiant region in each direction from the mean radiant centre, might be certainly anticipated for this meteor shower. The combined causes affecting the form of the radiant area, its principal concentration along a straight or crooked line, or elongated space, and its motion with the time, are accordingly so considerable and various, that the problem of arriving at a true theory of their action must evidently be regarded as still continuing to invite further attention and research. Among the determinations of the position of the radiant point with which I have, however, become acquainted since the compilation of the present list, Prof. Newton's observations on the radiant region, which appeared in NATURE, vol. vii. p. 122, will perhaps appear, from the following considerations, to point to a somewhat more definite conclusion.

In the accompanying projection (Fig. 1) the apparent paths of the 94 meteors mapped at Newcastle-on-Tyne, York, and Birmingham are drawn on a plane-perspective chart of the heavens in their observed lengths and positions. Both their general divergence from a common centre and the irregularities of their divergence in many cases in distant parts of the sky are plainly seen, while the shortness of the paths near the radiant point clearly illustrates the effect of perspective in foreshortening the apparent courses of those meteors whose visible paths were represented, as they appeared to the observers, to be approaching them "end on." Some few of the foreshortened meteors appeared quite stationary, and two of these are represented in the drawing by a small star. Nearly round the places of these two stationary meteors are drawn small circles representing the positions of the radiant point observed at York and Birmingham; a third small circle shows the place of that observed at Newcastle-on-Tyne. They are numbered respectively 17, 11, and 10 in the list, and in the map of radiant points (Fig. 2). A small circle below the equator and another near the east point of the plain sphere upon the ecliptic (Fig. 1) represent respectively the anti-apex (or point *from which* the earth was moving), and the anti-solar point, or point *opposite to* the sun's place at the time of the star-shower. The latter point, it will be seen, is more nearly in the direction of a parallel of declination through the radiant-point than in the direction of a meridian, and it is in the direction of right ascension, or nearly in that of the sun's apparent place at the time of the shower, that a considerable elongation of the radiant region is described as having been most plainly perceived by Prof. Newton.

In the map of the radiant-places (Fig. 2), lines drawn from the star γ Andromedæ (which is replaced in the figure by the positions of several radiant-points described close to it), through β and ε Andromedæ, downwards, and through the small star ρ Persei towards the left, point towards the anti-apex, and to the anti-solar point; while a third line drawn from the same star nearly through υ Persei and α Cassiopeiæ is in a direction transverse to that from the anti-apex. Those radiant-points of which the star places or co-ordinates are exactly given are represented in the map by a cross; where only described by their neighbourhood to certain stars the cross is surrounded by a circle, and when simply described by the constellations their positions are represented by a circle only.

A large number of radiant-points is contained in the space included between the stars γ, τ, υ, ω, and 51 Andromedæ (υ Persei) clustering closely about a small star (not shown in the map) χ Andromedæ, near the centre of the space, of which the position is very nearly that deduced from calculation, as the probable radiant-point of the cometary shower. The direction of the outlying radiant-places is chiefly towards Cassiopeia, and shows with some distinctness a general confirmation of the conclusion obtained from direct observations of the shower by Prof. Newton, that the area of the radiant region was perceptibly elongated in right ascension, or approximately in the direction of the sun's apparent place. That the effect of the sun's attraction on a cometary cloud would be to produce an elongation of the radiant area in that direction appears on astronomical grounds to be capable of demonstration; and in their sensible agreement with this condition the results of the present observations lend satisfactory support to the astronomical theory of the meteor stream. A more complete analysis of the features presented by the radiant area would probably require a careful investigation of the disturbances which the meteor cloud may have undergone during many previous revolutions of the comet; but from the present comparison of the observations with the astronomical theory of comets and of meteor showers, there appears at least to be abundant evidence in their generally accordant results to show that beyond the regular action of universal gravitation, no powerful force of repulsion from the sun, like that supposed to be concerned in the enormous development of the tails of comets, affects the meteor orbits or changes their courses more than the regularly recurring revolutions of the planets. In the projection (Fig. 3) the radiant-points only and the directions of the three lines drawn from γ Andromedæ towards the antisolar point S′, the anti-apex of the earth's way E′, and towards a point T, at right angles to the latter direction, are represented for greater clearness without the fixed stars or constellations.

In my last letter in NATURE, vol. vii. p. 103, on the time of the maximum and the duration of the star-shower, and on meteors connected with it seen on adjacent nights, the remarkably bright meteors from the same radiant-point observed by Mr. Jackson on the evening of November 24, were noted by him near Hyde Park, and not near Regent's Park, as stated in my letter. A considerable shower of shooting stars from a radiant-point near γ Andromedæ was, it appears, distinctly observed on the same night in the United States, as described by Prof. Newton in NATURE, vol. vii. p. 122. The notes of the numbers of meteors seen after 10 o'clock, described in the last paragraph of my former letter were made by my assistants and myself at Newcastle-on-Tyne, and not at Rothbury, as would appear from their connection with the description immediately preceding them, by my correspondent on the very brilliant appearance of the shower near the latter place.

A. S. HERSCHEL

NOTES

WE believe that a reply has been received from the Government on the subject of the Arctic Expedition, which goes far to justify all that was said in our leader last week on the subject; for although the Government does not refuse absolutely to comply with the wishes of the deputation, all action will, unless strenuous efforts are made, be postponed for a year. We repeat that the deputation did not represent Science so broadly as it ought to have been represented; and we add, that if the Government thought so, it was, in our opinion, perfectly justified in refusing the demands made upon the national purse. To a certain extent, what happened in the case of the Eclipse Expedition of 1870 has been now repeated. Our readers will recollect that on that occasion the mere personal application of the Astronomer Royal was at once very properly refused, while a proper representation by the leading Societies was at once as promptly acceded to.

WE beg to draw our readers' attention to a new medical journal which commenced its career yesterday, the *Medical Record*, and which, judging from the prospectus and the contents of the first number, is likely to be of the very highest service to the important department with which it is connected, and to the sciences on which that department depends. The *Medical Record* is a weekly review of the progress of medicine, surgery, obstetrics, and the allied sciences, but does not seek to trench on the ground already occupied by other medical journals. The object of this weekly periodical will be to supply medical readers with a condensed, readable, and reliable analysis of the immense mass of information relating to the medical sciences now scattered over the surface of British and Foreign periodical medical literature. The number, the bulk, the cost, and the diffusion of the transactions and periodicals at home and abroad, in which this information is contained, are now so great as to place it beyond the reach of the most industrious. The annual transactions of the great societies of Europe and America alone occupy some scores of volumes, therefore the idea is a happy one of gathering the cream of these transactions and presenting it in an accessible and manageable form, before the transactions are out of date, to those who otherwise might never get a glimpse of them. Moreover, as the prospectus says with truth, the age of year-books has passed away, and to make the labours of scientific inquirers in the medical as well as in other departments intelligible and of practical use, they must be studied and appropriated when first announced. To enable this to be done for medicine is the object of the *Medical Record*, and we have every reason to believe it will be eminently successful in attaining its end. The new journal will be edited by Mr. Ernest Hart. The abstracts will be signed in all cases. The staff includes upwards of forty of the best known scientific members of the profession, most of them hospital teachers in London, Edinburgh, and Dublin.

SIR WILLIAM JENNER has been elected President of the Pathological Society, London.

THE Lectureship on Botany of the St. Thomas's Hospital Medical School is vacant through the resignation of the Rev. J. W. Hicks. Applications should be sent to the Medical Secretary on or before January 10.

A NEW society has been organised in Sacramento, California, under the name of "The Agassiz Institute." It has been formed on the model of the Essex Institute, Salem, Massachusetts, and owes its birth in great part to the recent visit of Prof. Agassiz in California.

A NEW work on the Cetaceans and other Marine Animals of California, is announced by Captain Scammon. It will be published by subscription through the Naturalist's Agency, Salem, Massachusetts, U.S.A.

THE planet (128) which we noted last week as having been discovered by M. A. Barrelly on the night of December 4—5, is the same as that discovered by Prof. Watson, Ann Arbor Observatory, on the night of Nov. 25, noted in NATURE of December 19 last.

THE association proposed for the promotion of explorations in Africa by the Berlin Geographical Society has constituted itself under the title of the African Society, its principal members being Drs. Schweinfurth, Rohlfs, Bastian, Peschel, Bruhns, and Petermann.

THE *Challenger* left Lisbon yesterday.

THE United States Coast Survey party, in charge of W. H. Dall, arrived in San Francisco on the 20th of September, on the *Humboldt*, after an absence of thirteen months. This time had been chiefly spent in the region between Kadiah and Oonalaska, among the Aleutian Islands. Among the more important results of the work are the determination of ten islands and rocks, fourteen harbours and anchorages (and many minor details) not on any chart; the determination of a great oceanic current, a reflected branch of the great North Pacific easterly stream, which sweeps to the south and west, south of the peninsula of Alaska and the islands, having a breadth of about 350 miles; and the discovery of new fishing banks off the southern end of Kadiah. Geological and zoological researches were carried on by the members of the party during that portion of their time when hydrographic work was impracticable; and though these investigations were entirely subsidiary to the regular work, they were crowned with unexpected success, especially in the departments of botany and geology, and the various groups of marine vertebrates. These collections, although still but superficially examined, indicate a curious resemblance in some particulars between the fauna of the region visited and that of the Straits of Magellan, a number of forms found being common to both, and not yet discovered in the intervening regions.

THE American papers talk with just pride of the great engineering feat which is now nearly completed at the expense of the Massachusetts Treasury, and which will shorten the railway distance between Boston and Troy and Albany, by 40 miles. A tunnel 4·66 miles through the Hoosac mountains has been in progress since 1855, but was not seriously entered on till 1863. The cutting was made from both ends, and so nice were the calculations of the engineers, that when on December 12th last, the two boring parties met, the two cuttings were found to vary not more than a foot either in grade or in line.

SIR BARTLE FRERE and his suite left Aden on board the *Enchantress* for Zanzibar last Saturday.

IN reference to the Cambridge Natural Science Tripos a correspondent informs us that the new scheme of examination has been carried out for the first time in this Tripos. It is as follows:—The examination occupies eight days, six in one week and two in the next, the first three of which are devoted to six papers, intended to test a general elementary knowledge of all the subjects. Two days are then occupied by practical examinations in chemistry, anatomy, and physiology; and in the last three, six papers are set, each containing several questions relating to the higher branches of each subject; and a candidate may not be placed in the first class unless he show a competent knowledge of botany, chemistry, geology, mineralogy, or physics, or of any two of the following,—Anatomy, Physiology, or Zoology; the intention being that a student should confine his high reading to one, or at most two subjects.

THE third series of meetings of the Cambridge Natural Science Club, established in March 1872, by some of the junior members of the University, was held during the last October Term; a paper was read at each meeting by the member in whose rooms the Club met, and the attendance of members and of visitors was usually good, though as the examination for the Natural Sciences Tripos approached, it fell off slightly. The following is a list of the papers, which were illustrated as far as possible with drawings, specimens, or experiments:—The Theory of Pangenesis, by Mr. F. M. Balfour (Trinity); Geological Faults, by Mr. R. D. Roberts, B.Sc. (Clare); Some Bone-caves in Herefordshire, by Mr. J. J. H. Teall (St. John's); The Rock-fragment of the Cambridge Upper Greensand, by Mr. A. J. Jukes-Browne (St. John's); The recent Deep-sea Dredging Expeditions, by Mr. P. H. Carpenter (Trinity); The derived Fossils of the

Cambridge Upper Greensand, by Mr. A. F. Buxton (Trinity); The Mechanism of Consciousness and Volition, by Mr. H. N. Martin, D.Sc. (Christ's).

Mr. G. F. Rodwell lectures at the London Institution on Wednesday, 15th inst., on "Ancient Science."

The Sunday Lecture Society has issued a very satisfactory programme for the next three months. On Jan. 26, Mr. A. H. Green gives a lecture "On the Glacial Period; a Chapter of English Geology." On Feb. 23, Mr. A. Balmanno Squire lectures on "The Skin; its Structure and Uses." Last Sunday Mr. W. J. Lewis lectured on "The Next Transit of Venus, and the Measurement of the Distances of the Planets from the Sun."

The Mercers' Company have given notice that during the ensuing Hilary Term the lectures founded by Sir Thomas Gresham will be read to the public gratuitously in the theatre of Gresham College, Basinghall Street. Among them are lectures on Astronomy by the Rev. Joseph Pullen, on the 11th, 13th, and 14th inst.; Physic, by Dr. Symes Thompson, on the 17th and 18th; Geometry, by the Dean of Manchester, on the 25th and 27th.

A fund is being raised for founding, at University College London, an Exhibition in commemoration of the services of the late W. A. Case, M.A. The Exhibition is to be held by students on leaving the college school, with which Mr. Case was connected for twenty years. The amount already promised is upwards of 300*l.*

The Professor of Mineralogy (Mr. Miller) at Cambridge, will lecture on Mineralogy on Mondays, Tuesdays, Wednesdays Fridays, and Saturdays, from 1 to 2, in the lecture-room at the north end of the west wing of the new museum, commencing January 31.

Two very interesting birds have just been received by the London Zoological Society, an American Stilt or Stilt-plover (*Himantopus nigricollis*), and a Darter (*Plotus anhinga*), both of them remarkable in form and appearance, and new to the Society's collection. They are to be seen in the Fish-house.

The first number of the new monthly journal of popular antiquities, *Long Ago*, is a capital one, the contents being very varied and of wide range. If it keeps up as it has begun, it will be of real and lasting value.

A new series of the *Mechanics' Magazine* is to be commenced this month, under the new and admirably brief title of *Iron*.

We would draw the attention of our readers to a series of letters on the marriage of the Emperor of China which have been appearing in the *Daily News*, especially to the one in Tuesday's issue describing the structure of "the Temple of Heaven" and other temples, in which certain astronomical notions seem to be involved, suggesting comparison with certain theories about the pyramids of Egypt.

We are glad to see, from some scraps sent us from the New York papers, under the title of "News Splinters," that Prof. Tyndall is making excellent use of Mr. W. Spottiswoode's polariscope apparatus. So impressive and popular apparently are his lectures on polarisation, that one of the "splinters" remarks that "if anybody don't go who can get a ticket to go to hear this very remarkable course of lectures, he or she deserves rectilinear propagation into outer darkness." We believe that Prof. Tyndall is expected back on the 25th or 26th inst.

We are glad to see, in the *Mercantile Marine Magazine*, an article on "Meteorology: Past, Present, and Future, General and Particular." It would, however, have been better had the writer had the courtesy to acknowledge that his article was suggested by, and is largely based upon, an article in Nature for December 12 last, on the "Meteorology of the Future."

We learn from the *British Medical Journal*, that there is some prospect that a long-talked of scheme—the removal of the Medical School of St. Andrew's University to Dundee—may be carried out. A large field for medical instruction is to be obtained in connection with the Dundee Royal Infirmary; and a similar step, that of the University of Durham, which established a Medical School in Newcastle, has not been without success.

The following is from the *Medical Record*:—"The recent meeting at Bordeaux of the French Association for the Promotion of Science, in its first annual session, appears to have sown seed which is likely to ripen in good fruit in that city. At a preliminary meeting held on Dec. 20, a committee was named, consisting of well-known physiologists, chemists, and men of science and others, to carry out a proposed scheme of general regulations for a laboratory of physiological and chemical research. Important sums were offered for the purpose, and the muncipality of Bordeaux, appreciating the importance of encouraging scientific labours, will, it is stated, contribute handsomely to the installation and maintenance of the proposed laboratory."

The feuilleton of the *Gazette Medicale* for January 4 contains a number of details concerning English medical education, medical fees and etiquette.

The number of *L'Institut* for January next commences a new series. This Journal has been in existence for forty years.

Stanley's "How I found Livingstone," is being translated in *Le Tour du Monde*.

There is a very good article in the *Field* for January 4, exposing some popular delusions with regard to the dangers incurred by living in or travelling through countries where snakes are abundant. The writer thinks it would be difficult to produce a well-authenticated instance of a European having been killed by a snake in any tropical country. Many of these delusions the writer ascribes to the sensation stories found in some popular novels, *e.g.* "Tom Cringle's Log," and some of Marryatt's works, as also in the narratives of credulous travellers, and even in the works of such an eminent ornithologist as Audubon. "The actual risk incurred," the writer says, "by those who visit and explore the haunts of snakes is practically so inconsiderable as very soon to become habitually as much disregarded as is the existence of the common adder in this country." He also animadverts with justice on the extreme vagueness of the multitude of popular names applied to snakes, and speaks of the necessity of always recognising the established system of technical nomenclature, without which all is vague and delusory.

We have received a lecture delivered before the Torquay Natural History Society by its Vice-president, the Rev. T. R. R. Stebbing, M.A., on "Museums and *Our* Museum," in which he gives some very excellent hints as to what a model museum, both general and local, ought to be. This society has been in existence for twenty-eight years, and during that time has done much useful scientific work, and accumulated a valuable collection of specimens illustrating the natural history of the country, which already exceeds the accommodation at the society's disposal. Its reference library is also rapidly increasing in bulk, and the society has therefore appealed to the Torquay public to assist in raising such a building as will satisfy the requirements of the lectures, library, and museum. Not only for the sake of the society, but for the sake of their own highest good, we hope the public of Torquay will respond liberally to the society's appeal.